Rubber Research Scheme

(CEYLON.)

Third Quarterly Circular

FOR

1926.

Peradeniya, October, 1926.

GENTLEMEN,

Herewith the Third Quarterly Circular for 926, dealing with the following subjects :—

"Effect of Pollarding Rubber Trees."

"The influence of the reaction and the concentration of the Medium on the Growth of *Phytophthora Faberi* in Artificial Culture."
By R. H. Stoughton-Harris, Mycologist.

"The effect of adding Glue to latex preserved with Caustic Soda."

"On the effect of different methods of drying sheet Rubber on Plasticity."
Received from the London Advisory Committee.

Note on "Secondary Leaf-fall in South India."

Reports received.

Notice reference Plans for Smoke Houses for Rubber Estates.

J. MITCHELL,
Organising Secretary.

RUBBER RESEARCH SCHEME (CEYLON),
Peradeniya, 21st October, 1926.

EFFECT OF POLLARDING RUBBER TREES.

The need for pollarding rubber trees frequently occurs around bungalow sites or in other places where it is desirable to reduce the shade afforded by tall trees, but not to cut out the trees entirely. It has been observed that the new crowns produced on such pollarded trees rarely suffer from secondary leaf-fall for the first year or two of their growth. In addition, it was considered that if the new crown should be attacked it would be easy to spray it from the ground, and the operation be well within the limits of estate practice.

It was suggested by a Superintendent of an estate in the Kalutara District, that an experiment on pollarding should be carried out by the Rubber Research Scheme, and facilities were offered on that estate. It was further considered that some useful information on the effect of pollarding on the yield of the trees might also be obtained. It was finally decided to pollard the trees on half an acre of matured rubber. The chief difficulty to contend with in pollarding was to secure adequate protection of the cut surfaces and to encourage the process of healing. Special attention was given to this point.

Design of the Experiment.—A plot of 50 trees of uniform growth and on flat even land was chosen, and each tree was conspicuously numbered. An adjacent plot of 50 trees was also numbered to serve as a control. Both plots were tapped on alternate days on half the circumference of the tree and records of the yields of latex from each tree were kept from January 1st, 1925, onwards. These yield records were subsequently converted into cubic centimetres for convenience in the analysis of the figures. All trees were rested from February 1st to April 14th in 1925 and 1926.

During early February the trees to be pollarded were examined and each one marked at the place considered most suitable for cutting. The average height of the cut was from 12—15 feet from the ground. Where a tree forked below 12 feet from the ground it was pollarded a few feet above the fork.

The pollarding was carried out at the end of February, 1925, and the beginning of March, the cut surfaces having a slope of 45°—50° and arranged to face towards the North. All cuts were at once treated with Cargillineum Mixture

smeared on thinly and evenly. For permanently protecting the cut surface half the cuts were covered with a layer of Skene's wax, and the other half were painted with coal tar. In addition, half the number of each kind were protected by specially made black painted tin shields or cylinders, which encased the cut branch or stem. These treatments were combined in such a way as to give equal opportunities for healing to all the trees dealt with. Of the 50 trees so pollarded 25 were continued in tapping, while the remainder were rested for one year.

Effect of pollarding on yield.—In this report the yield figures for the 1st year of tapping only are dealt with, that is, of the 25 pollarded trees continued in tapping, together with the 50 control trees. In order to have the same number of trees in each group of figures to be compared, the control block was divided into two plots of 25 trees each, designated Control I, and Control II. The mean yields per plot for each month of the first year of the experiment were as follows:—

1925	Pollarded trees rested 25 trees.	Pollarded trees tapped 25 trees.	Control I. 24 trees.	Control II. 25 trees.
January (before pollarding)	32.96 c.c.	27.32	39.14	32.32
April ...	—	15.52	38.66	36.56
May ...	—	16.14	45.00	40.70
June ...	—	17.98	46.98	48.76
July ...	—	15.82	50.80	51.25
August ...	—	19.92	55.17	57.14
September ...	—	16.68	40.50	39.90
October ...	—	17.10	32.80	35.28
November ...	—	Records believed erroneous		
December ...	—	17.14	38.12	42.10
1926.				
January ...	—	13.50	33.20	35.10
February ...	—	14.30	34.20	28.20
Mean		16.38	41.54	41.70

From a mathematical examination of these yield figures the following conclusions are derived:—

1. In the first month of tapping (before pollarding) there is no significant difference between the yields of any of the plots which shows that the trees in all the plots were relatively the same.

2. It will be noted that throughout the experiment no significant difference existed between the two control plots showing that no special conditions other than pollarding affected the yields of the various plots.
3. There was a large fall in the yield of the (tapped) pollarded plot in April, 1925, resulting in a pronounced significant difference between the mean yield for this plot and that of each of the controls.
4. The pronounced difference in yield between the experimental plot and the controls remains throughout the period under review.

The 25 pollarded trees which were rested during 1925 were brought into tapping in April, 1926, and the records for these are now being kept.

Effect of pollarding on leaf-fall.—It was observed that all the pollarded trees suffered very severely from secondary leaf-fall during the first part of the S. W. Monsoon in 1925 and again in 1926, and much of the foliage was lost. In 1925 many of the new shoots died back but a good crown developed later on most of the trees. It would appear however that most of the shoots have a very feeble attachment to the parent trunk, and many have been broken during high winds.

Healing of the Cuts.—Healing of the cut surfaces does not appear to have begun on any of the trees, and it seems probable that in many cases it will be necessary to cut back the trunk a foot or more owing to decay. On most of the trees the shoots have arisen at some distance from the cut end, and dying-back occurs most frequently in these instances. Saprophytic fungi were observed growing on most of the cuts, more so on those treated with Skene's Wax than on those which were tarred. The metal caps do not appear to have been of any assistance in preventing decay or in the healing of the cuts.

The results given herewith are of a preliminary character and it will be necessary to obtain further data before any definite conclusions can be made.

R. H. STOUGHTON-HARRIS,
Mycologist.

RESEARCH SCHEME LABORATORIES,
CULLODEN ESTATE,
NEBODA.

3rd August, 1926.

THE INFLUENCE OF THE REACTION AND THE CONCENTRATION OF THE MEDIUM ON THE GROWTH OF *PHYTOPHTHORA FABERI* IN ARTIFICIAL CULTURE.

1. THE REACTION OF THE MEDIUM.

The reaction, that is, the degree of acidity or alkalinity, of the various artificial media used in growing fungi for study under laboratory conditions is known to have an influence on the growth of the fungi, and it was thought worth while to ascertain the effect on *Phytophthora Faberi*, the causal organism of secondary leaf-fall, pod-rot and patch canker of rubber, of changes in the reaction of certain media on which it was growing. The reaction of a medium can be measured accurately in terms of what is known as its hydrogen-ion concentration, or, more shortly, its **pH**. It is believed that certain phenomena of parasitism, for example, the mechanism of resistance to the attack of a parasitic fungus, can be explained in terms of the **pH** value of the sap of the plant; in other words, that the condition of the sap of a given plant may increase or diminish the resistance of the plant to an invading fungus according to its acidity or alkalinity, that is, according to its pH.

Experiments were therefore undertaken in which *Phytophthora Faberi* was grown in media consisting of Coon's and Richards' solutions solidified with agar. In these experiments, batches of the media were prepared with varying amounts of acid and alkaline substances (malic acid and sodium carbonate) in such a way that they varied in their **pH**. Each batch was inoculated with *Phytophthora Faberi*, and the growth of the fungus in the different media was carefully measured.

It was found that the reaction of the medium had a great influence on both the rate and the amount of growth of the fungus. At **pH** concentrations round about neutrality (**pH**=7.0) and leaning towards acidity, the rate of growth of the fungus was constant. On a strongly acid medium, however, it diminished. The amount of growth, again, was at a

maximum when the medium was distinctly acid with its pH at 6.2. This result is interesting. The pH of *Hevea* bark lies between 6.2 and 6.4, and it follows that, from a certain point of view, *Phytophthora* is well adapted to grow parasitically on *Hevea* bark. It also follows that certain changes in the pH of *Hevea* bark towards a greater acidity may result in a lessened severity of attack by the fungus because the *Hevea* bark has become a less suitable medium for growth. It is conceivable that the beneficial effects of manuring in the control of secondary leaf-fall are brought about in a similar way, that is, through changes induced in the reaction of the cell-sap of the tree.

2. THE CONCENTRATION OF THE MEDIUM.

Like the reaction of the medium, its concentration has an influence on the growth of fungi in culture. When a medium consisting of Richards' solution with two per cent agar was used in a series of dilutions, it was found that maximum growth of the *Phytophthora* took place at a strength of one-fifth normal, but that the rate of growth was practically unaffected by concentrations varying between twice normal and one-hundredth normal. The fungus has thus a wide range of concentrations suited to its growth on the particular medium used in the experiments.

R. H. STOUGHTON-HARRIS,
Mycologist.

RESEARCH SCHEME LABORATORIES,
CULLODEN ESTATE,
NEBODA.

31st August, 1926.

Report on

THE EFFECT OF ADDING GLUE TO LATEX PRESERVED WITH CAUSTIC SODA.

The technical trials carried out by Mr. Kaye on the use of preserved latex in the manufacture of paper boards indicated that latex preserved with caustic soda was not as satisfactory as that preserved with ammonia owing to local coagulation in the dilution tanks. It was subsequently observed by Mr. O'Brien that the addition of glue to preserved latex immediately before coagulation prevented local coagulation on the addition of acid.

A sample of latex preserved with 0·6 per cent caustic soda has since been received from Ceylon with the request that vulcanisation tests should be carried out at the Imperial Institute with crepe prepared from the latex.

In accordance with Mr. O'Brien's suggestions, a portion of the latex was coagulated with acetic acid in the absence of glue, and another portion after the addition of 3 per cent of glue (added as a 20 per cent solution). In both cases local coagulation occurred immediately on the addition of acetic acid, and it was necessary to add a large quantity of acid to obtain a clear serum.

The results of vulcanising tests in a rubber-sulphur mixing (90 : 10) on the two samples thus obtained are as follows: –

Amount of glue added.	Time of Vulcanisation.	Tensile Strength.	Elongation.		Slope.
			At break.	At load of 1·04 kgs./sq. mm.	
per cent on latex.	Mins.	lbs./sq. in.	per cent.	per cent.	
none.	70	2290	851	772	36
3	70	2220	861	784	38

Both samples vulcanised quickly and had a normal tensile strength.

The crepe from the latex to which glue had been added was found to contain 2·88 per cent protein and that from the latex to which no glue had been added contained 2·04 per cent protein. It would appear therefore that 0·84 per cent of glue (calculated on the dry rubber) was retained in the coagulum. It had no effect however on the vulcanising and mechanical properties of the rubber.

IMPERIAL INSTITUTE,
SOUTH KENSINGTON,
LONDON, S. W. 7.
May 11th, 1926.

REPORT ON THE EFFECT OF DIFFERENT METHODS OF DRYING SHEET RUBBER ON PLASTICITY.

In preliminary tests carried out on a series of 48 unsmoked sheets and crepes dried in air, which were prepared on four estates in different parts of Ceylon, it was found that unsmoked sheet was less plastic than crepe (*see* Third Quarterly Circular, 1925, p. 18). On the other hand smoked sheet has been found by different investigators to be as plastic as crepe and it therefore appeared probable that smoked sheet is more plastic than air-dried unsmoked sheet. The following series of samples was accordingly prepared in Ceylon at the suggestion of the London Committee with a view to comparing the plasticities of sheet rubber dried in air at different temperatures and in smoke for different periods.

For this purpose a quantity of latex from Culloden Estate, New Division, "35 acre" field, was coagulated and rolled to sheet. One portion was dried in the Culloden factory drying room; a second portion was dried in the laboratory, at 55-60°C for 15 days for 12 hours each day; and others in the Culloden Estate smokehouse for 3, 6, 9, 12 and 15 days respectively. In each case the drying of the smoked samples was completed in the Culloden Estate factory drying room. Two further portions were dried for 15 days in the smoke houses on the Clyde and Polygahakande Estates, and finally in air.

The relative plasticity of the samples has been compared at the Imperial Institute by pressing out a ball of rubber 0.4 gram in weight from each sample under a load of 5 kgs. and measuring its thickness after 30 minutes. The more plastic the rubber, the thinner the test piece becomes on pressing.

The following are the results obtained: –

Sample No.	Method of Preparation.	No. of tests.	Thickness after pressing 30 mins. mms. /100
1199	Sheet dried in air	4	200
1200	„ „ „ at 55-60°C	6	192
1201	„ „ „ Culloden Estate smokehouse 3 days and then in air	7	195
1202	„ „ „ Culloden Estate smokehouse 6 days and then in air	6	188
1203	„ „ „ Culloden Estate smokehouse 9 days and then in air	6	188
1204	„ „ „ Culloden Estate smokehouse 12 days and then in air	4	187
1204A	„ „ „ Culloden Estate smokehouse 15 days and then in air	9	186
1205	„ „ „ Clyde Estate smokehouse 15 days and then in air ...	5	177
1206	„ „ „ Polygahakande Estate smokehouse 15 days and then in air	5	181

The results show that the sheet dried in air at the ordinary temperature is the least plastic of the samples. Drying at a higher temperature in air has softened the rubber a little, but drying in smoke is more effective.

Smoking for 6 days appears to soften the rubber as much as smoking for 15 days.

Of the rubbers smoked for 15 days that dried in the Clyde Estate smokehouse is the most plastic, and that dried in the Culloden Estate smokehouse is the least plastic. In this connection it may be stated that the Clyde smokehouse is a single storey building with a brick furnace sunk in the

ground, whereas the smokehouses on the other two estates are two storey buildings. Jungle wood was used as fuel on the Clyde Estate, rubber wood on the Polygahakande Estate, and mixed rubber and jungle wood on the Culloden Estate.

There was little difference in the temperature of the three smokehouses, that on the Polygahakande Estate being kept at 49°C and the other two between 43°C and 46°C.

It is of interest to record that the average results of power consumption tests during mastication and mixing, and tests on the rate of extrusion through a small orifice, also indicated that the unsmoked sheet rubber was less plastic than the others and that drying in air at a temperature of 55-60°C softened the rubber a little but not so much as drying in smoke at a temperature of 43-49°C.

IMPERIAL INSTITUTE,
LONDON, S. W.,
21st July, 1926.

NOTE ON SECONDARY LEAF-FALL IN SOUTH INDIA.

With reference to the report on a visit to South India, which appeared in the Second Quarterly Circular for 1926, Mr. H. Ashplant has drawn my attention to the statement on page 17 "The loss due to secondary leaf-fall is impossible to estimate but is certainly not less than 10 lbs. per acre." He estimates that "owing to the debilitation resulting from secondary leaf-fall South India yields are less by about 70 lbs. per acre than they would otherwise be. In addition to this there is an annual falling away in yield after June in each year due to the loss of so much foliage which is estimated at 10 lbs. per acre. Results obtained by spraying suggest that the annual set back is from 10 to 30 lbs. per acre according to the severity of the leaf-fall."

This means that the adverse effect of secondary leaf-fall on yields in South India is believed to be much greater than was stated in Mr. Harris' report.

J. MITCHELL,
Organising Secretary.

Peradeniya,
21st October, 1926.

REPORTS RECEIVED.

Report on "The Inter-relationship of Yield and the various vegetative characters in Hevea Brasiliensis" by Mr. R. A. Taylor is now in the press for issue as Rubber Research Scheme Bulletin No. 43 and Department of Agriculture Bulletin No. 77.

"Notes on Smoke-houses" by Mr. T. E. H. O'Brien is now in the press for issue as Rubber Research Scheme Bulletin No. 44 and Department of Agriculture Bulletin No. 79. It is proposed to issue reprints of this Bulletin printed in Sinhalese.

Report on "The Physiology of Phytophthora Faberi (Maubl.)" by Mr. R. H. Stoughton-Harris. A summary of this is included in the present Circular.

Report on "The efficiency of disinfectants and fungicides" by Mr. R. H. Stoughton-Harris. This report, subject to revision is, in due course, to be published as a Research Scheme Bulletin.

Report on "Experiments on the control of Bark Rot by disinfectants" by Mr. R. H. Stoughton-Harris. This report, subject to revision is, in due course, to be published as a Research Scheme Bulletin.

Report on "The effect of Pollarding Rubber Trees" by Mr. R. H. Stoughton-Harris. A summary of this is included in the present Circular.

Report on "Natural immunity of Rubber trees to Bark Rot" by Mr. R. H. Stoughton-Harris. This is to be published in a forthcoming Quarterly Circular.

Report on "The effect of different methods of drying sheet rubber on plasticity" from the London Advisory Committee. This is included in the present Circular.

Report on "The effect of adding glue to latex preserved with Caustic Soda" from the London Advisory Committee. This is included in the present Circular.

NOTICE.

Plans for Smokehouses for Rubber Estates.

Enlarged plans of Smokehouses for Rubber Estates of 10, 15 and 100 acres as described in "Rubber Research Scheme Bulletin No. 44" can be obtained from the

PUBLICATION DEPOT.,
DEPARTMENT OF AGRICULTURE,
PERADENIYA,

at the following prices, post free:—

Sheet 1	... 10 acres	... Cents	50
Sheet 2	.... 15 acres	.... ,,	50
Sheets 3A & 3B	100 acres	.... Re.	1.00

Peradeniya,
1st October, 1926.